



REVISION OF THE INDIAN SPECIES OF THE
GENUS *PHANEROTOMA* WESMAEL, 1838
(CHELONINAE : BRACONIDAE)

DISSERTATION

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF

Master of Philosophy

IN

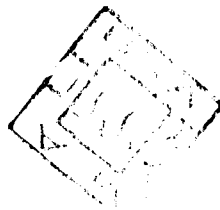
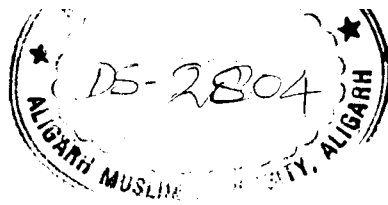
ZOOLOGY

BY

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This is to certify that Miss Kalpna Varshney has completed her M. Phil. work under my supervision on the problem entitled "Revision of the Indian Species of the genus *Phanerotoma* Wesmael, 1838 (Cheloninae; Braconidae)". This is an original contribution and distinct addition to the existing knowledge on the subject. Being satisfied with the quality and quantity of the work, she is permitted to submit, in partial fulfilment, for the award of M. Phil. degree in Zoology of the Aligarh Muslim University, Aligarh.

(Shujauddin)
14/5/96
Reader

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KALPNA VARSHNEY

II. INTRODUCTION

Genus *Phanerotoma* Wesmael

The genus *Phanerotoma* Wesmael, belongs to the subfamily Cheloninae (Braconidae; Hymenoptera). The chelonines are the egg-larval parasitoids of lepidopterous pests and a number of species have been tried in biological control projects [Patel et. al., 1958; Nobel & Hunt, 1973].

The genus *Phanerotoma* was first described by Wesmael, 1838 to accommodate type species *chelonus dentatus* Panzer (Designated by Haliday 1840 in Westwood).

Chelonus Nees von Esenbeck, 1834, *Hym. Ichn. affin. Mon.*, 1: 277.

Phanerogaster Wesmael, 1838, *Nouv. Mem. Acad. Brux.*, 11: 165 (as alternative name).

Ascogaster (*Phanerotoma*): Blanchard, 1840, *Hist. nat. Anim. Artic., Hym.*, 3: 337.

Phaenotoma [!] Ashmead, 1894, *J. Linn. Soc.*, 25: 124, Key [err. type.].

Neophanerotoma Szepligeti, 1908, *Notes Leyden Mus.*, 29: 227.

Type species: *Phanerotoma orientalis* Szepligeti.
(Design by Viereck 1914).

Phanerotomina Shestakov 1930 *Russk. ent. obozr.* 24: 100.

Type species: *Phanerotomina gussakovskii*
Shestakov. (Monobasic & Orig. design.).

Sulydus Du Buysson, 1897, *Annls Soc. ent. Fr.* 66: 354.

Type species: *Sulydus marshalli* Du Buysson
(Monobasic).

Recently, Achtherberg (1990) has placed the following genera *Ichneutipterus* Vachal, 1907; *Tritoma Szepligeti*, 1908; *Szepligetia* Schulz, 1911; *Neoacampis Szepligeti*, 1914 and *Tritomios* Strand, 1921 as synonyms of *Phanerotoma*.

Most of the species of the genus *Phanerotoma* are of economic interest, since they are egg-larval parasitoids of Lepidoptera. In spite of great economic importance no work is available on the systematics and bionomics of this genus from Indian subcontinent.

So far 128 species are recorded under this genus [Shenefelt, R.D., 1973; Santis, de, 1975; Papp, J., 1989; Achtherberg, van, 1990; Zettel, H., 1992; Moreno et. al., 1992]. Thirteen species belong to Indo-Australian region, of which only two (*P. hendecasisella* Cameron and *P. buchneri* Fahringer) have been described from India so far.

The present study is based on Aligarh collection and from the limited material a number of species have been identified. Thus it is presumed that, in India, having varied climatic conditions, a large number of unidentified species may be recorded.

III. MATERIALS AND METHODS

Collection and Rearing:

The adult braconid parasitoids were collected from different areas of Aligarh by using sweeping net and light traps. Hosts i.e. lepidopterous larvae were also reared. They were collected in collecting bags. A complete record was maintained indicating the locality, date of collection, name of the host plant etc. The samples were later transferred from the collecting bags to the rearing jars. The open end of the jars were covered with muslin cloth tightly held with rubber band. The jars were checked daily and fresh leaves were provided to the caterpillars for feeding. Emerged parasitoids were preserved in 70% ethyl alcohol with one or two drops of glycerine in each vial for their future identification.

Mounting Methods

Specimens were mounted on cards using water soluble glue. The permanent slides were prepared after dehydration and clearing was done in clove oil. The specimens were dissected under dissecting binocular with the help of fine needles. The dissected parts viz. antennae, wings, legs and other body parts were placed in canada balsam on a slide in

required positions and covered by coverslips. The slides were dried by keeping in thermostat at 37°C for 24 hours.

Illustrations and Measurements

The permanent slides were examined under the microscope for detailed study. Drawings were made with the help of camera lucida. Measurements were taken by an ocular micrometer.

IV. GENUS *Phanerotoma* Wesmael

(Fig.1)

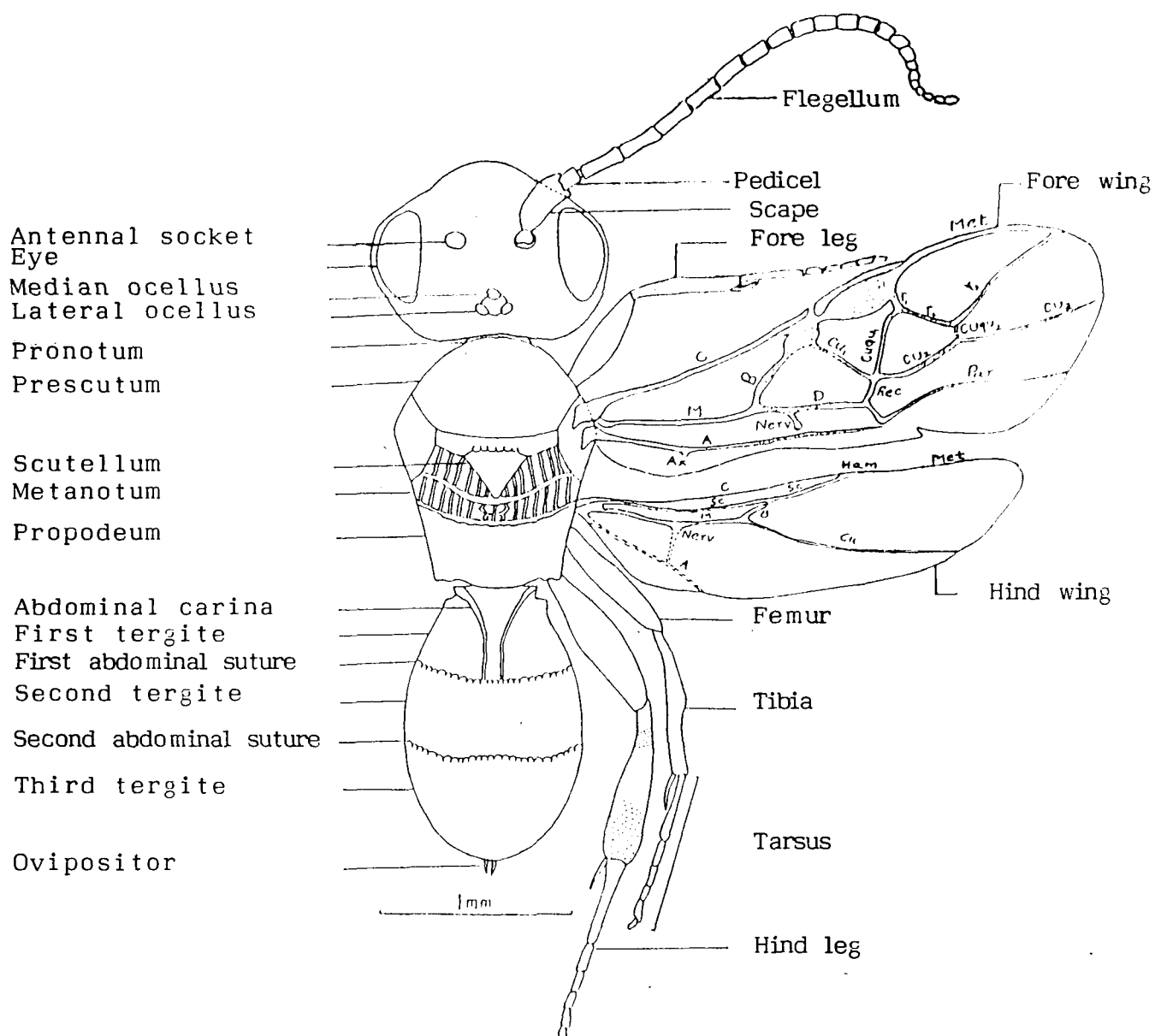
Diagnostic characters

Body usually pubescent. Head often subcubical; occiput excavated; frontoclypeal suture well marked; eyes glabrous, rounded and protruding; lower margin of clypeus equipped with 2 or 3 small teeth; mandibles bidentate, upper tooth longer than lower; antennae usually 23-segmented.

Thorax strongly built; sutures absent, if present weakly indicated; propodeum convex, generally equipped with a mid transverse carina and two lateral teeth. Forewings with three cubital cells, the second much variable; radial vein with three abscissae; recurrent may or may not be interstitial with first transverse cubitus.

Abdominal carapace divided by two distinct crenulated sutures, second suture straight or curved; ovipositor may or may not be exerted.

Colour from yellow, yellowish brown to black.



V. Key to Indian Species of the Genus *Phanerotoma* Wesmael

1. Second abscissa of radius nearly equal to that of first.
Upper tooth of mandibles slightly longer than lower.
Propodeum without a mid transverse carina. Frons
punctate.....6
- Second abscissa of radius much longer than the first.
Upper tooth of mandibles distinctly longer than lower.
Propodeum with a mid transverse carina. Frons rugose or
punctate.....2
2. First transverse cubitus strongly curved at its base.
Carapace with second suture straight. Frons finely
punctate. Frontal carina prominent and bifurcated,
running from frons to frontoclypeal suture.....
..... *P. dichocrophaga* sp.n.
- First transverse cubitus slightly curved at its base.
Carapace with second suture curved. Frons rugose. Frontal
Carina not bifurcated.....3
3. Recurrent vein interstitial with first transverse
cubitus.....4
- Recurrent vein not interstitial with first transverse
cubitus.....5

Phanerotoma hendecasisella Cameron ♀

(Fig. 1)

ABBREVIATIONS USED

A - anal vein; Ax-axillary; B-basal; C-Costa; cu_1 - first abscissa cubitus; cu_2 - Second abscissa cubitus; cu_3 - third abscissa cubitus; $cuqu_1$ - first transverse cubitus; $cuqu_2$ - second transverse cubitus; D-discoidal; Ham-hamulus; M-median; Met-metacarp; Nerv-nervellus; Par-parallel; r_1 -first abscissa radius; r_2 - second abscissa radius; r_3 -third abscissa radius; Rec - recurrent.

V. Key to Indian Species of the Genus *Phanerotoma* Wesmael

1. Second abscissa of radius nearly equal to that of first.
Upper tooth of mandibles slightly longer than lower.
Propodeum without a mid transverse carina. Frons
punctate.....6
- Second abscissa of radius much longer than the first.
Upper tooth of mandibles distinctly longer than lower.
Propodeum with a mid transverse carina. Frons rugose or
punctate.....2
2. First transverse cubitus strongly curved at its base.
Carapace with second suture straight. Frons finely
punctate. Frontal carina prominent and bifurcated,
running from frons to frontoclypeal suture.....
..... *P. dichocrophaga* sp.n.
- First transverse cubitus slightly curved at its base.
Carapace with second suture curved. Frons rugose. Frontal
Carina not bifurcated.....3
3. Recurrent vein interstitial with first transverse
cubitus.....4
- Recurrent vein not interstitial with first transverse
cubitus.....5

Antennal socket
 Eye
 Median ocellus
 Lateral ocellus

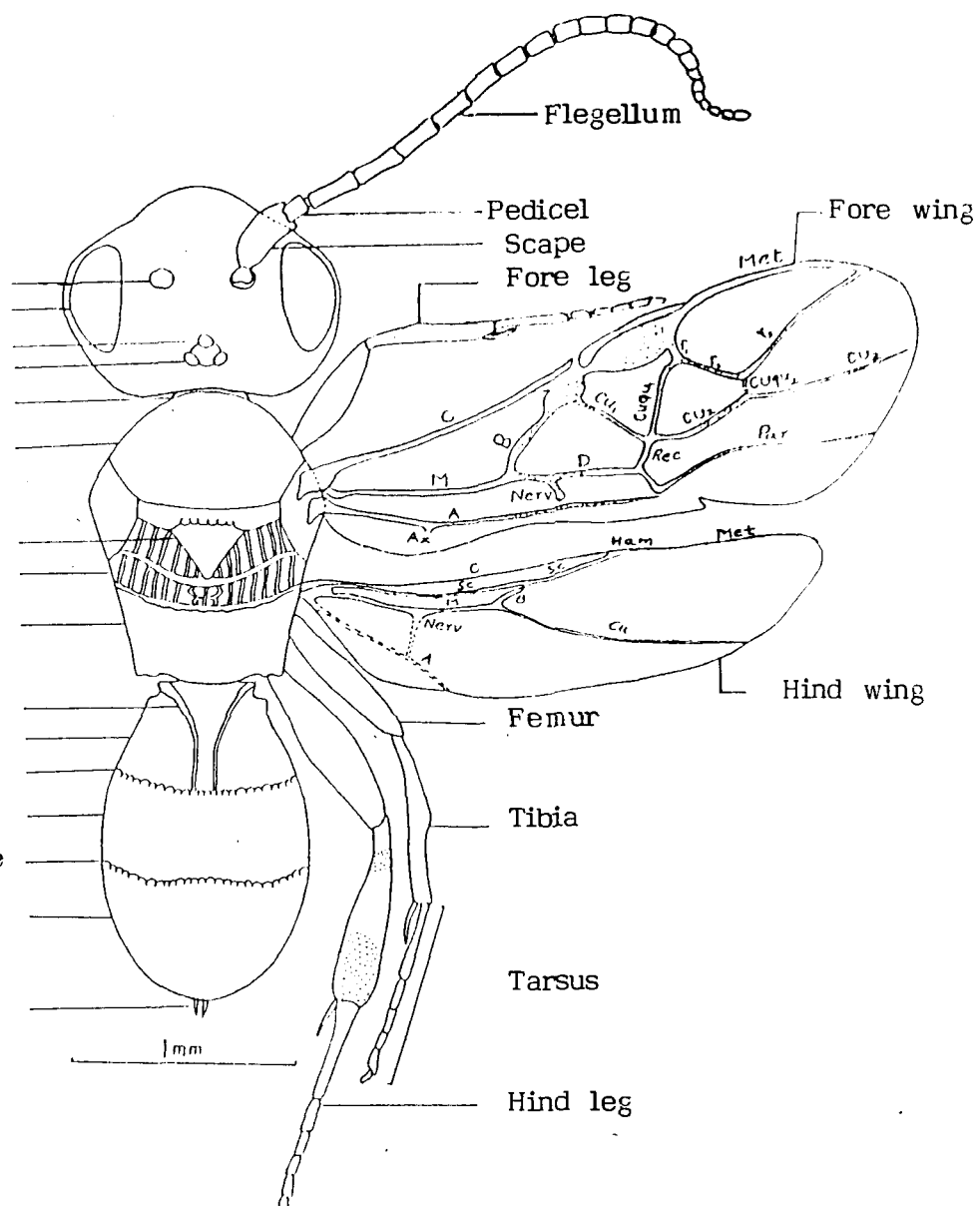
Pronotum
 Prescutum

Scutellum
 Metanotum

Propodeum

Abdominal carina
 First tergite
 First abdominal suture
 Second tergite
 Second abdominal suture
 Third tergite

Ovipositor



4. Antennal segments 18-22 moniliform. Frontal carina narrow and prominent extending from anterior ocellus up to middle of frons..... *P. hendecasisella* Cameron
- Antennal segments 18-22 elongate. Frontal carina broad and prominent, extending from anterior ocellus up to frontoclypeal suture..... *P. agarwali* sp.n.
5. Antennal segments 18-22 nearly two times longer than broad. Frontal carina narrow, less prominent, running from anterior ocellus but not reaching up to frontoclypeal suture..... *P. aligarhensis* sp.n.
- Antennal segments 18-22 more than two times longer than broad. Frontal carina narrow, prominent, running from anterior ocellus up to frontoclypeal suture.....
..... *P. indica*, sp.n.
6. Frontal carina absent. Recurrent vein almost in a straight line with first transverse cubitus. First and second abscissae of radius not in a straight line
..... *P. yagyai* sp.n.
- Frontal carina broad and distinct running from frons to frontoclypeal suture. Recurrent vein not in a straight line with first transverse cubitus. First and second abscissae of radius almost in a straight line.....
..... *P. ashae* sp.n.

1. *Phanerotoma hendecasisella* Cameron (Fig. 1 & 2)

Phanerotoma hendecasisella Cameron 1905 *Spolia zeylan.* 3(10): 80.

Phanerotoma hendecasiella [!]: Wilkinson 1930 *Bull. ent. Res.* 21(4): 482.

Phanerotoma hendecailla [!]: Butani 1958 *Indian J. Ent.* 20: 272.

Female: Body 3.65 mm long, covered with long pale hairs. Head in dorsal view nearly 1.16 times as broad as long (52:45), reticulately - punctate; occiput excavated; apical margin of clypeus with 3 minute teeth; mandibles bidentate, upper tooth much longer than lower; eyes almost round, protruding; ocelli almost on an equilateral triangle; Frontal carina narrow, prominent and extending from anterior ocellus up to middle of frons, the latter rugose on either side of carina; antennae 23-segmented, shorter than body (130:185); scape nearly twice as long as broad (15:7), first flagellar segment 3 times longer than broad (12:4), further segments gradually shortening, penultimate segment as long as wide (2:2), apical segment 1.5 times as long as broad (3:2), segments 18-22 moniliform.

Thorax longer than broad (68:56); prescutum reticulate, parapsidal furrows weakly indicated; scutellum punctate, triangular, the suture at its base crenulate, areas on either

side of scutellum and metanotum longitudinally striated; propodeum with a mid transverse carina and two lateral teeth, reticulate, punctate. Forewing shorter than the body (134:185); pterostigma 2.6 times as long as wide (26:10), 1.53 times shorter than metacarp (26:40); r_1 short, r_2 almost straight, about 4 times longer than r_1 (14:4), r_3 2.57 times longer than r_2 (36:14), slightly curved towards metacarp; first transverse cubitus slightly curved at its base, second transverse cubitus as long as r_1 (4:4), recurrent interstitial with first transverse cubitus.

Carapace almost as long as thorax (70:68), 1.5 times longer than broad (70:47); sutures crenulate, second suture curved and with longer crenulations; first tergite slightly longer than second but shorter than third (23: 21: 26), rugulose, punctate and with two basal longitudinal converging carinae reaching up to the first suture; second and third tergites reticulate, punctate; apex of the carapace excised; ovipositor slightly exserted.

Dominant colour blackish yellow. Head, major part of abdominal tergites and legs yellow; thorax, a ring above the base and tip of hind tibiae and antennae blackish yellow, apical 9 segments of latter and tip of mandibles darker; eyes

and ocelli brown, ocellar spot black; wings hyaline, proximal one-third of stigma and veins light yellow, parastigma, costa metacarp, proximal portion of discoidal, radius and second abscissae of cubitus brown.

Male: Similar to ♀ but differs in usual sexual characters and antennal segments 18-22 not moniliform.

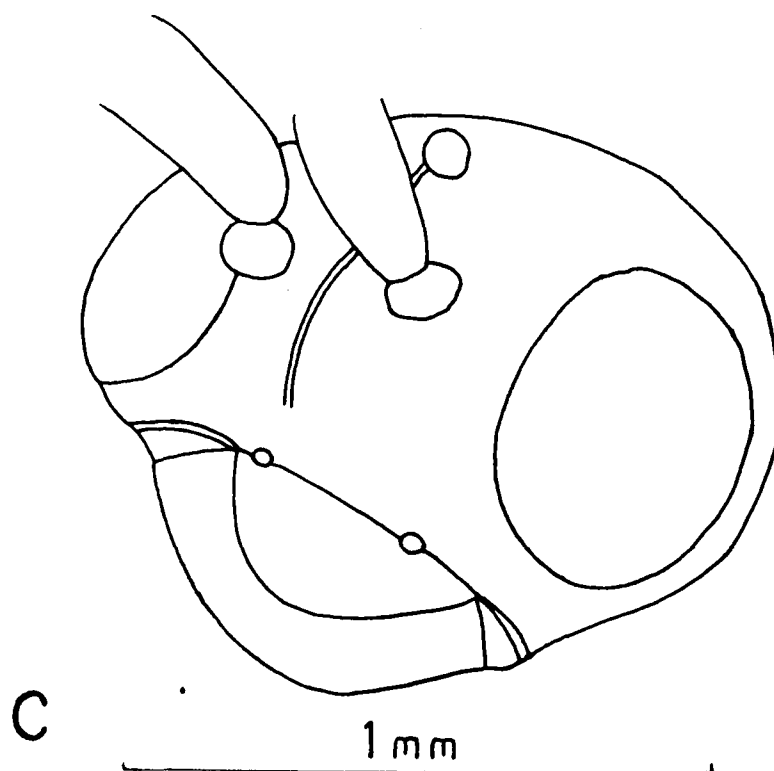
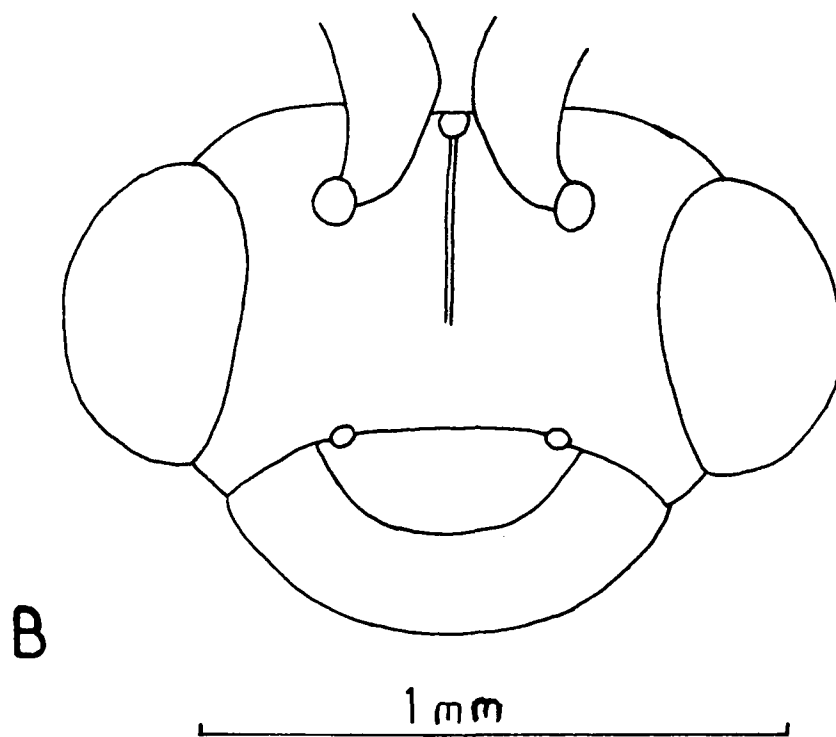
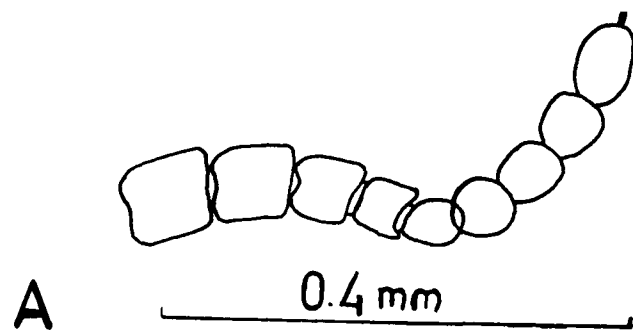
Material Examined: 19 ♀, 1♂, INDIA: Uttar Pradesh, Aligarh, 9. viii. 1995, ex. *Nephopteryx rhodobasalis* Hmps. on *Cassia fistula* (Kalpna Varshney).

Remarks: The present material shows following differences from *P. hendecasisella* Cameron, 1905 - Antennae shorter than the body, first and second abscissae of radius not forming an arc, veins not touching the apex of the second cubital cell and second transverse cubital vein half the length of recurrent vein.

Since the original description is not complete and type is not available. Further, the material reported as *P. hendecasisella* (Patil & Thontadarya, 1987; Peter & David, 1992) from India is also not available for comparison and confirmation. Therefore, for the time being it has been considered as the *P. hendecasisella* Cameron, 1905. Further study after comparison with the type will only establish the true identity of the present taxa.

Fig.2: A-C. *Phanerotoma hendecasisella* Cameron ♀

- A. Antennal segments 15-23.
- B. Head in frontal view.
- C. Head in lateral view.



2. *Phanerotoma dichocrophaga* Sp.n. (Fig.3)

Female: Body 3.23 mm long, covered with long pale hairs. Head in dorsal view slightly longer than broad (38:34), reticulate punctate, occiput not excavated deeply; clypeus with 3 minute teeth; mandibles bidentate; eyes almost round protruding; ocelli forming an equilateral triangle; frons finely punctate, frontal carina prominent, bifurcated, running from frons to frontoclypeal suture; antennae 23-segmented, shorter than the body (134:153), scape slightly less than 2 times longer than broad (14:8), first flagellar segment about 2.5 times longer than broad (10:4), further segments gradually shortening, segments 19-22 1.5 times longer than broad (3:2), apical segment nearly 2 times longer than broad (3.5:2).

Thorax longer than broad (55:43); prescutum reticulate, parapsidal furrows weakly indicated; scutellum punctate, triangular, the suture at its base crenulate, areas on either side of scutellum and metanotum obliquely striated; propodeum rugose-punctate, with a mid transverse carina and two lateral teeth, Forewing shorter than the body (128:153); pterostigma 2.6 times as long as wide (26:10), 1.4 times shorter than metacarp (26:37); r_1 short, r_2 straight, about 7.5 times

longer than r_1 (15:2), r_3 2.26 times longer than r_2 (34:15), slightly curved towards metacarp; first transverse cubitus strongly curved at its base, second transverse cubitus slightly longer than r_1 (3:2), recurrent almost in a straight line with first transverse cubitus.

Carapace reticulate, slightly longer than thorax (60:55), 1.7 times longer than broad (60:35), second suture straight, first tergite slightly longer than second but equal to that of third (21:18:21) and with two longitudinal converging carinae, not reaching up to the first suture, 5-6 short longitudinal carinae also present; apex of carapace excised; ovipositor slightly exserted.

Head, apical 8-segments of antennae, thorax, apical one-third and a basal ring at hind tibiae, tarsi blackish yellow; proximal segments of antennae, legs, abdominal tergites yellow; eyes, ocellar spot and median ocellus black, posterior ocelli brown; wings hyaline, costa, major part of stigma, basal, discoidal and nervellus yellow, rest of the veins pale.

Male: Unknown

Holotype ♀, INDIA: Uttar Pradesh, Aligarh, 15. x. 1980, ex *Dichocrocis punctiferalis* Guenee on *Ricinus communis* (Shujauddin) - paratype 1♀, same as above.

Remarks: The new species *Phanerotoma dichocrophaga* can be easily differentiated from *P. hendecasisella* Cameron by the strongly curved first transverse cubitus, straight second abdominal suture, frons finely punctate, bifurcated frontal carina running from frons to frontoclypeal suture and r_2 nearly 7 times longer than r_1 .

Fig.3: A-I. *Phanerotoma dichocrophaga* sp.n. ♀

A. Fore wing

B. Antenna

C. Antennal segments 17-23

D. Fore leg

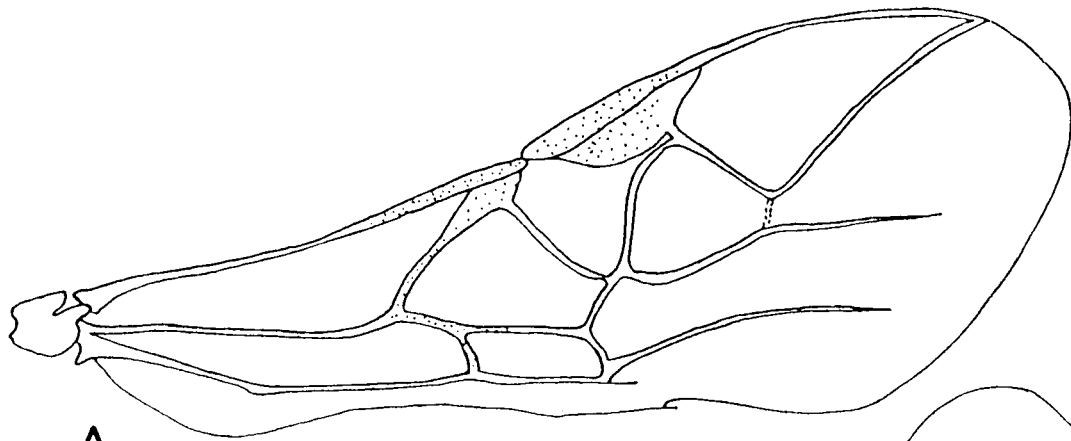
E. Mid leg

F. Hind leg

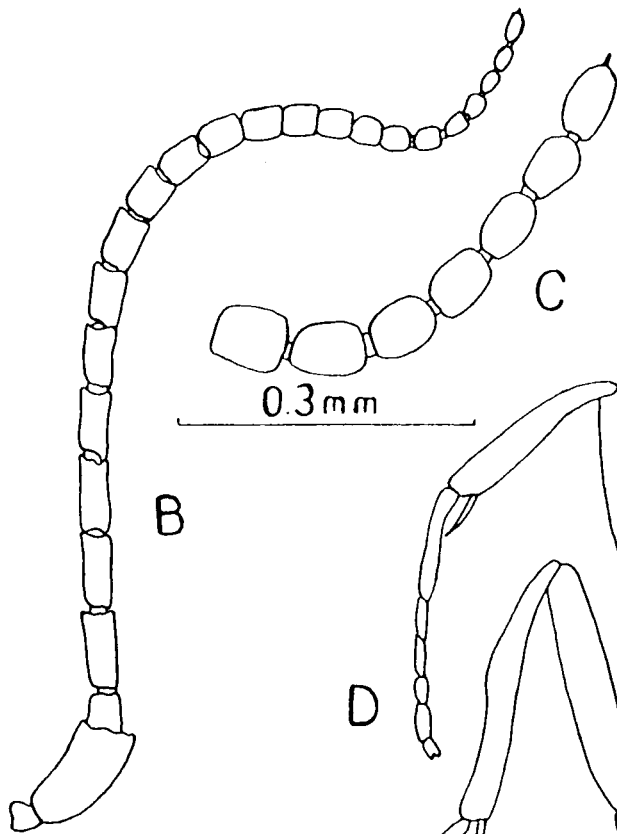
G. Head

H. Thorax

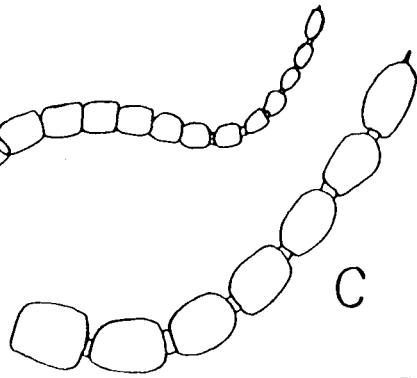
I. Abdomen



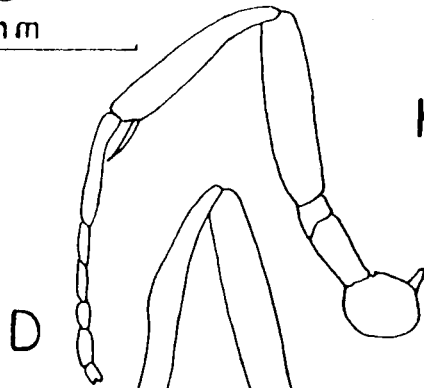
A



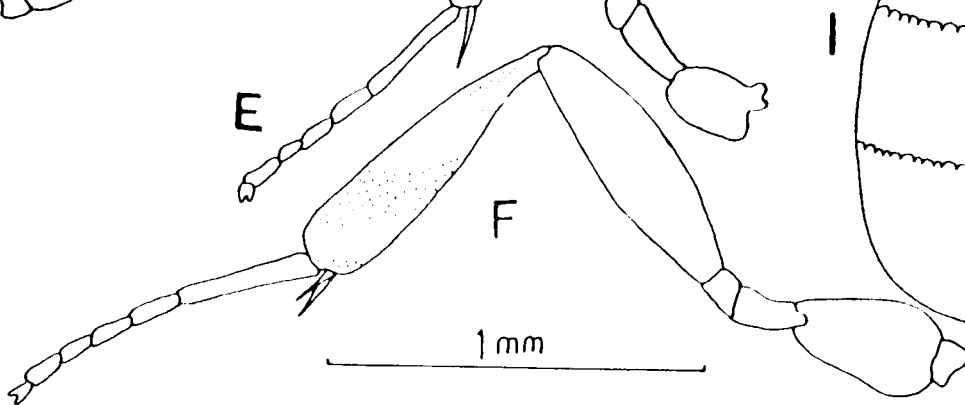
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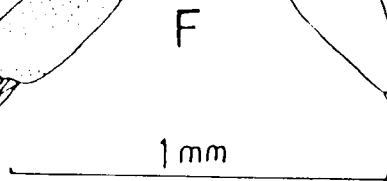
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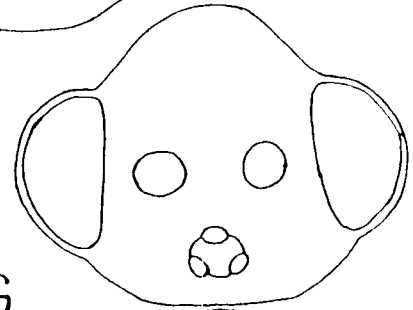
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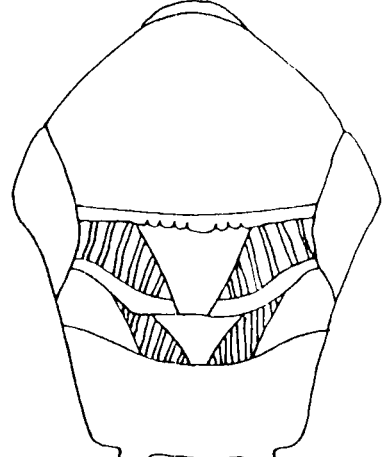
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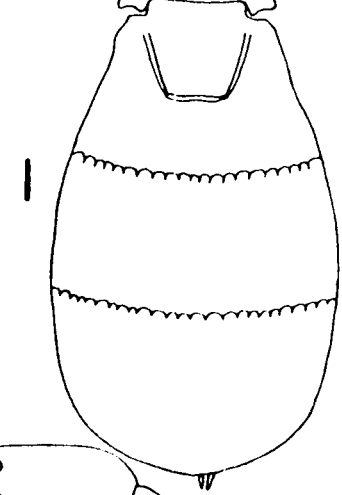
F



G



H

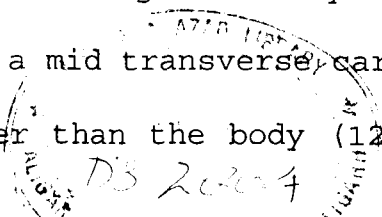


I

3. *Phanerotoma agarwali* sp.n. (Fig.5)

Female: Body 4.15 mm long, pubescent. Head in dorsal view nearly as broad as long (42:40), rugose-reticulate, punctate; occiput excavated; apical margin of clypeus with 3 minute teeth; mandibles bidentate, upper tooth much longer than lower; eyes almost round, protruding; ocelli almost on an equilateral triangle; Frons rugose, frontal carina broad and prominent extending from anterior ocellus upto frontoclypeal suture; antennae 23-segmented, shorter than the body (143:166), scape about 2 times longer than broad (13:6), first flagellar segment slightly less than 4 times longer than broad (11:3), further segments gradually shortening, segments 12-16 are equal in length and width (3:3), segments 17-22 1.5 times longer than broad (3:2), apical segment about 2 times longer than broad (3:1.5).

Thorax longer than broad (60:42), provided with three brown bands; prescutum reticulate, punctate, parapsidal furrows weakly indicated; scutellum punctate, triangular, the suture at its base crenulate, areas on either side of scutellum and metanotum longitudinally striated; propodeum rugose-punctate, with a mid transverse carina and two lateral teeth. Forewing shorter than the body (120:166); pterostigma



nearly 3 times longer than broad (20:7), nearly 2 times shorter than metacarp (20:35); r_1 short, r_2 straight, nearly 4 times longer than r_1 (13:3), r_3 nearly 2 times longer than r_2 (30:13), almost straight; first transverse cubitus slightly curved at its base, second transverse cubitus slightly longer than r_1 (4:3); recurrent interstitial with first transverse cubitus.

Carapace slightly longer than thorax (66:60), 1.3 times longer than broad (66:42), sutures crenulate, second suture slightly curved; first and second tergites nearly equal, third longer (18:19:29), reticulate-punctate; first tergite with two longitudinal carinae not reaching up to first suture; apex of carapace slightly excised; ovipositor concealed.

Head, thorax, propodeum blackish brown; proximal 15 segments of antennae, first and second tergites of abdomen and legs yellow; distal 8 segments of antennae, tip of hind tibiae, third abdominal tergite brownish yellow; eyes and ocelli brown; ocellar spot black; wings hyaline, stigma, parastigma, costa, basal, proximal portion of discoidal, nervellus, r_1 , r_2 , proximal portion of r_3 brown, rest of the veins pale.

Male: Unknown

Holotype ♀, INDIA: Uttar Pradesh, Aligarh, 2. IX. 1968, by sweeping (Shujauddin) - Paratype 1 ♀, same as above.

Remarks: The new species *Phanerotoma agarwali* is closely related to *P. hendecasisella*, but can easily be differentiated by the antennal segments 18-22 elongate, broad frontal carina extending from anterior ocellus up to frontoclypeal suture.

4. *Phanerotoma aligarhensis* sp.n. (Fig.4)

Female: Body 3.33 mm long, pubescent. Head in dorsal view nearly 1.4 times as broad as long (46:33), rugose-punctate; occiput excavated; apical margin of clypeus with 3 teeth; mandibles bidentate, upper tooth much longer than lower; eyes rounded, protruding; ocelli forming almost an equilateral triangle; frontal carina narrow and prominent running from anterior ocellus but not reaching upto frontoclypeal suture, the latter is provided with a small tooth, frons rugose; antennae 23-segmented, almost equal to that of body (161:159), scape nearly 3 times longer than broad (14:5), first flagellar segment nearly 3 times longer than broad (11:4), further segments gradually shortening, segments 18-22 nearly two times longer than broad (4:2), apical segment less than 3 times longer than broad (5:2).

Thorax longer than broad (65:48), provided with three brown bands; prescutum reticulate, punctate, parapsidal furrows weakly indicated; scutellum punctate, triangular, the suture at its base crenulate, areas on either side of scutellum and metanotum longitudinally striated; propodeum with a mid transverse carina and two lateral teeth, rugose-reticulate punctate. Forewing shorter than the body

(133:159); pterostigma 2.6 times as long as wide (26:10), 1.5 times shorter than metacarp (25:37); r_1 short, r_2 nearly 4 times longer than r_1 (13:3), straight, r_3 nearly 2.6 times longer than r_2 (34:13), slightly curved towards metacarp; first transverse cubitus curved at its base, second transverse cubitus slightly longer than r_1 (4:3); recurrent not interstitial with first transverse cubitus.

Carapace slightly shorter than thorax (61:65), 1.7 times longer than broad (61:36), sutures crenulate, second suture slightly curved; first and second tergites nearly equal, third longer (15:17:29), reticulate - punctate; first tergite with two longitudinal converging carinae not reaching up to the first suture; apex of Carapace slightly excised; ovipositor concealed.

Dominant colour yellowish brown. Thorax with brown bands, legs, 1st and 2nd abdominal tergites yellow; eyes, ocelli, tips of hind tibiae and 3rd abdominal tergite brown, ocellar spot black; wings hyaline, stigma, parastigma, costa, basal, proximal portion of discoidal, nervellus, r_1 , r_2 , proximal portion of r_3 brown, rest of the veins pale.

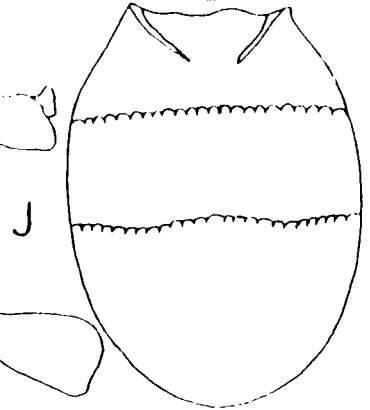
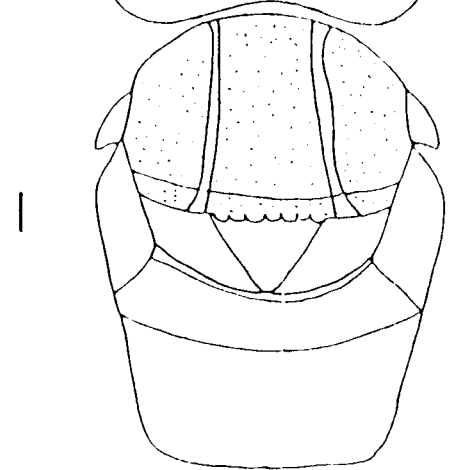
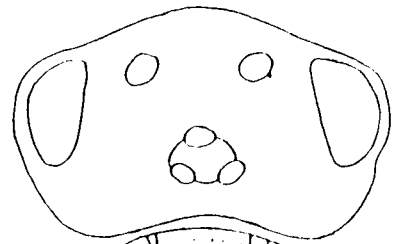
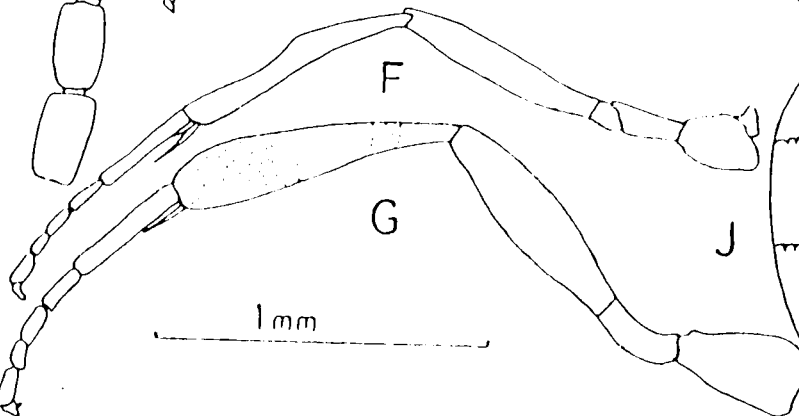
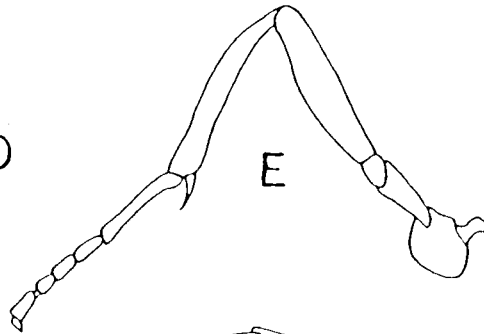
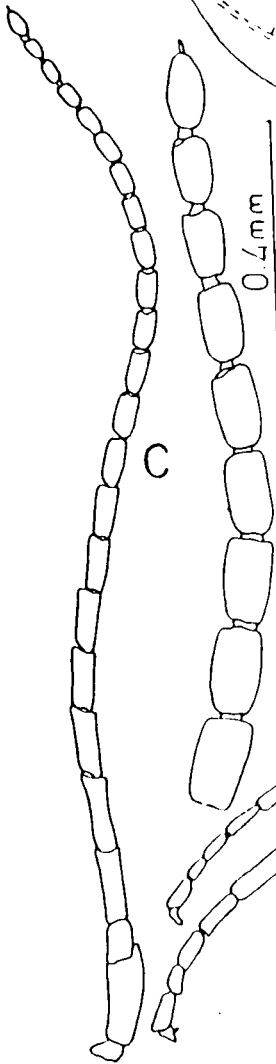
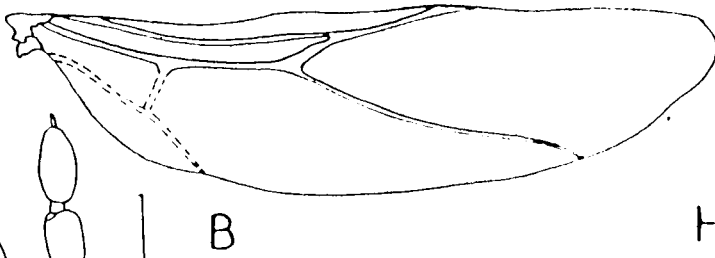
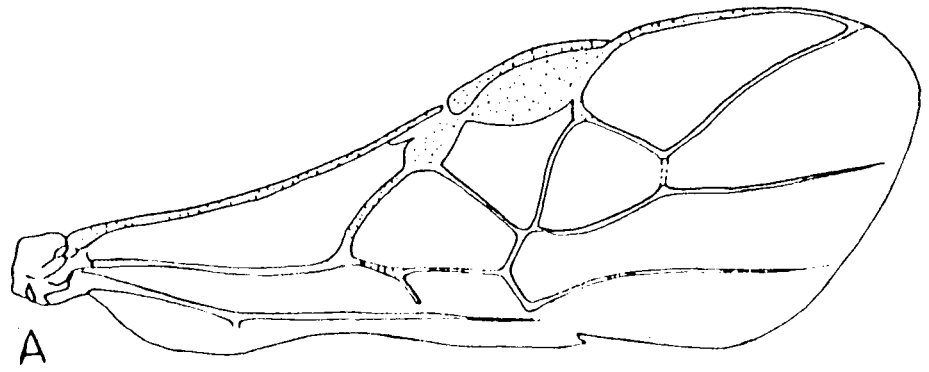
Male: Antennal tips broken.

Holotype ♀, INDIA: Uttar Pradesh, Aligarh, 7. X.
1968, ex leaves of *Bauhinia variegata* (Shujauddin) -
Paratypes 2♀, 1♂, same as above.

Remarks: The new species *Phanerotoma aligarhensis* resembles with *P. hendecasisella* Camerson, but can easily be distinguished by following characters - recurrent not interstitial, apical segment of antennae more than 3 times longer than broad, segments 18-22 elongated and thorax with brown bands.

Fig.4: A-J. *Phanerotoma aligarhensis* sp.n. ♀

- A. Fore wing
- B. Hind wing
- C. Antenna
- D. Ant~~e~~mal segments 15-23
- E. Fore leg
- F. Mid leg
- G. Hind leg
- H. Head
- I. Thorax
- J. Abdomen



5. *Phanerotoma indica* sp.n. (Fig.5)

Female: Body 3.63 mm long, pubescent. Head in dorsal view 1.25 times as broad as long (45:36), rugose punctate; occiput excavated; apical margin of clypeus with 3 teeth; mandibles bidentate, upper tooth much longer than lower; eyes almost round, protruding; ocelli forming almost an equilateral triangle; Frons rugose, Frontal carina narrow and prominent, running from anterior ocellus up to frontoclypeal suture; antennae 23-segmented, slightly shorter than the body (149:177), scape nearly two times longer than broad (13:6), first flagellar segment nearly 3 times longer than broad (11:4), segments 18-22 nearly 2.7 times longer than broad (4:1.5), apical segment nearly 3 times longer than broad (5:1.5).

Thorax longer than broad (70:52), provided with three brown bands, central band not reaching upto scutellum; prescutum reticulate, punctate, parapsidal furrows indicated; scutellum punctate, triangular, the suture at its base crenulate, areas on either side of scutellum and metanotum longitudinally striated; propodeum with a mid-transverse carina and two lateral teeth, rugose-reticulate, punctate. Forewing shorter than the body (127:177); pterostigma 2.4

times as long as wide (24:10), 1.5 times shorter than metacarp (24:36); r_1 short, r_2 straight, 4 times longer than r_1 (12:3), r_3 nearly 2.8 times longer than r_2 (33:12), slightly curved towards metacarp; first transverse cubitus nearly straight, second transverse cubitus slightly longer than r_1 (4:3); recurrent not interstitial with first transverse cubitus.

Carapace as long as thorax (70:70), 1.6 times longer than broad (70:44), sutures crenulate, second suture slightly curved; first tergite nearly equal to second but shorter than third (20:17:33), punctate, and with two longitudinal carinae not reaching up to first suture; second and third tergite reticulate punctate; apex of carapace slightly excised; ovipositor concealed.

Dominant colour brownish yellow. Thorax with brown bands; tips of mandibles, eyes and ocelli brown; third abdominal tergite, tips of hind tibiae blackish brown; wings hyaline, costa, stigma, parastigma, basal, r_1 , r_2 proximal portion of discoidal, nervellus brown, rest of the veins pale.

Male: Unknown

Holotype ♀, INDIA: Uttar Pradesh, Aligarh, 2.IX. 1968,
by sweeping (Shujauddin) - Paratypes 9♀, same as above.

Remarks: The new species *Phanerotoma indica* is closely related to *P. aligarhensis* but can easily be distinguished by antennal segments 18-22 more than two times longer than broad. Frontal carina running from anterior ocellus up to frontoclypeal suture.

Fig.5: A-C *Phanerotoma agarwali* sp.n. ♀

A. Fore wing

B. Antenna

C. Antennal segments 16-23.

Fig.5: D-F. *Phanerotoma indica* sp.n. ♀

D. Antenna

E. Antennal Segments 15-23

F. Fore wing

6. *Phanerotoma yagyai* sp.n. (Fig.6)

Female: Body 2.73 mm long, pubescent. Head in dorsal view nearly as broad as long (24:23), rugose-punctate; occiput not excavated deeply; clypeus smooth, apical margin with 3 minute teeth; mandibles bidentate, upper tooth slightly longer than lower; eyes almost round, protruding; ocelli forming an equilateral triangle; frons without carina, finely punctate; antennae 23-segmented, shorter than body, scape 2.5 times longer than broad (10:4), first flagellar segment 3.5 times longer than broad (7:2), further segments gradually shortening, segments 18-22 moniliform, apical segment nearly 2 times longer than broad (3:1.5).

Thorax longer than broad (38:26), prescutum reticulate, punctate, parapsidal furrows absent; scutellum triangular, finely punctate, the suture at its base crenulate, areas on either side of scutellum and metanotum longitudinally striated; propodeum reticulate punctate, without the transverse carina and lateral teeth. Forewing shorter than the body (85:109); pterostigma 1.4 times shorter than metacarp (12:17); r_1 , r_2 equal in length (3:3) and not in a straight line, r_3 more than 3 times longer than $r_1 + r_2$ (20:6), curved near the apex of the wing; first transverse

cubitus slightly curved and almost in a straight line with recurrent, second transverse cubitus slightly longer than r_1 (or r_2) (4:3).

Carapace nearly 2 times longer than broad (48:25) and about 1.3 times as long as thorax (48:38); sutures crenulate, straight; first tergite nearly equal to second but shorter than third (15:13:20), rugulose-punctate with two basal converging carina not reaching up to the first suture; second and third tergites reticulate - punctate; apex of carapace slightly excised; ovipositor exerted.

Dominant colour brown. Head, tip of mandibles, proximal 8 segments of antennae, ocelli, thorax, fore tibiae, tarsi and hind legs brown; distal 15 segments of antennae, first and second abdominal tergites blackish brown; eyes, ocellar spot, third abdominal tergite black; mid legs pale yellow; wings hyaline, median, basal and second transverse cubitus pale, rest of the veins brown.

Male: Unknown

Holotype ♀, INDIA: Uttar Pradesh, Aligarh, 10. VII. 1982, by sweeping (Shujauddin).

Remarks: The present species slightly resembles *P. leeuwinensis* Turner, 1917, but differs in having following

characters: antennae shorter than the body and abdomen pubescent.

In addition to above differences, the original description of *P. leeuwinensis* being insufficient and based on a male, the present species is tentatively recognised as a new one.

7. *Phanerotoma ashae* sp.n. (Fig.6)

Female: Body 2.9 mm long, pubescent. Head in dorsal view slightly longer than broad (30:27), rugose - punctate; occiput not excavated deeply; clypeus smooth, tridentate; mandibles bidentate, upper tooth slightly longer than lower; eyes almost round, protruding; ocelli forming an equilateral triangle; frons finely punctate; antennae 23-segmented, shorter than body, scape nearly twice longer than broad (11:5), first flagellar segment nearly 2 times longer than broad (7:3), further segments gradually shortening, length of penultimate segment nearly equal to its width (2:2), apical segment slightly longer than broad (2:1.5).

Thorax slightly longer than broad (38:30), prescutum reticulate-punctate, parapsidal furrows absent; scutellum triangular, punctate, the suture at its base crenulate, areas on either side of scutellum and metanotum longitudinally striated; propodeum rugose-punctate, without a transverse carina. Forewing shorter than the body (80:118); pterostigma nearly 3 times longer than broad (14:5), almost equal to that of metacarp (14:13); r_1 , r_2 nearly equal in length and almost in a straight line (3:3), r_3 less than 3 times longer than $r_1 + r_2$ (16:6), slightly curved; first transverse cubitus

straight and not in a straight line with recurrent, second transverse cubitus equal to r_2 ($=r_1$).

Carapace nearly 2 times longer than broad (50:29) and about 1.3 times as long as thorax (50:38); sutures crenulate, straight; first tergite equal to that of second but smaller than third (15:15:20), rugulose-punctate and with two basal converging carina not reaching up to the first suture; second and third tergites reticulate, punctate; apex of carapace slightly excised; ovipositor exerted.

Head, tips of mandibles, distal 13 segments of antennae, thorax, basal one-third and apical one-third of hind tibiae and third abdominal tergite brown; proximal segments of antennae yellow; legs, first and second abdominal tergites pale yellow; eyes and ocelli black; wings hyaline, proximal one-third of pterostigma, median, basal, first abscissa of cubitus, second transverse cubitus, recurrent and parallel nervure pale yellow, rest of the veins brown.

Male: Unknown

Holotype 1 ♀, INDIA: Uttar Pradesh, Aligarh, 10. VII. 1982, by sweeping (Shujauddin).

Remarks: The new species *Phanerotoma ashae* is closely related to *Phanerotoma yagyai* differing in few characters i.e.

Frontal carina broad and distinct running from frons to frontoclypeal suture, recurrent vein not in a straight line with first transverse cubitus and first and second abscissae of radius almost in a straight line.

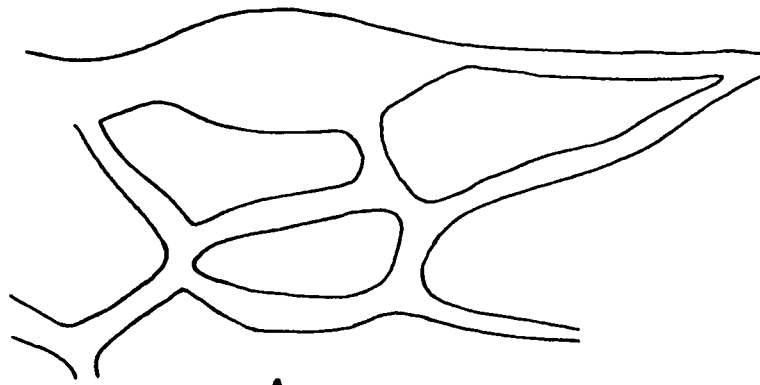
Fig.6: A. *Phanerotoma ashae* sp.n. ♀

A. Distal part of fore wing

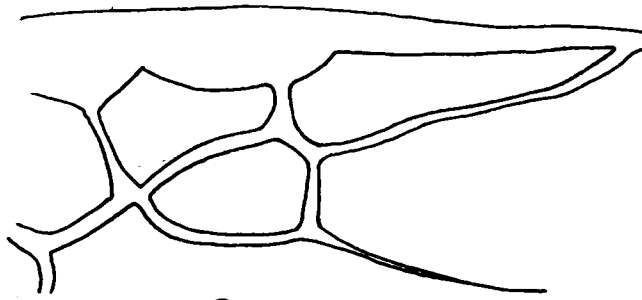
Fig.6: B-C. *Phanerotoma yagyai* sp.n. ♀

B. Distal part of fore wing.

C. Head in frontal view.

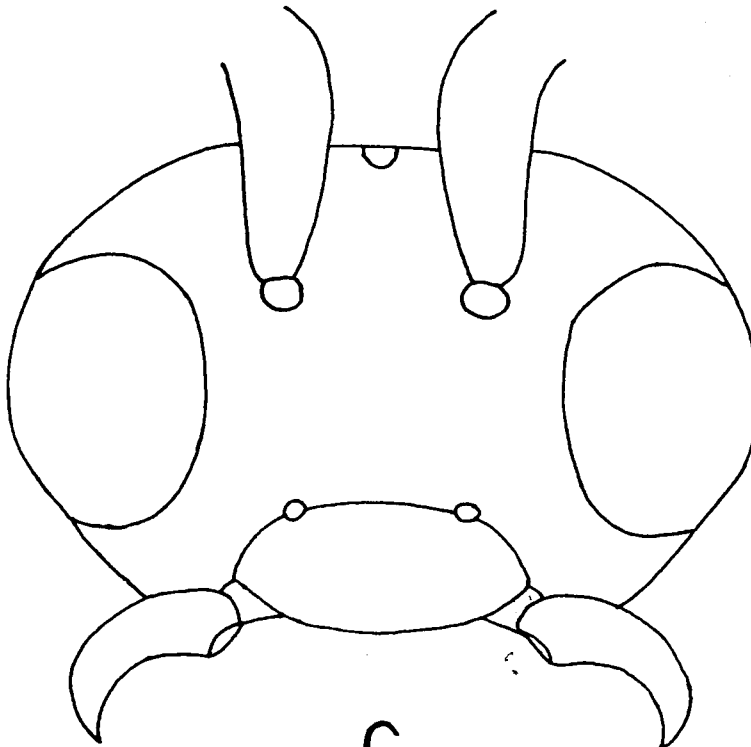


A



B

1mm



C

0.5mm

VI. DISCUSSION

The genus *Phanerotoma* Wesmael is represented by two species from India viz. *P. buchneri* Fahringer and *P. hendecasisella* Cameron. However, it is interesting to note that the genus is repeatedly reported either as *Phanerotoma* sp. (Mallik, S.N. et. al., 1989; Tripathi S.R. & Singh A.K., 1991) or as *P. hendecasisella* (Patil B.V. & Thontadarya T.S., 1987; Peter C. & David B.V., 1991; Sudheendrakumar V.V., 1993). The present worker is convinced that the above reports are not based on correct identification of the taxa. The insufficient description of *P. hendecasisella* and non-availability of the type material might have resulted in lots of confusion in the identification of correct taxon. Since all the native species are very closely related and differing only in minute details given with each new taxon, it may be inferred that a group of closely related species had been erroneously referred as *P. hendecasisella* in the past.

VII. SUMMARY

The present study is confined to the genus *Phanerotoma* Wesmael. Seven species have been collected from Aligarh (U.P.), out of which six are described as new taxa. The status of the genus *Phanerotoma* is discussed and the new taxa have been illustrated with the help of thirty two diagrams.

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* Not seen in original.